Processing Methods Tested

a. standard processing *(baseline case)*

b. fixed aerosol model pair *(control case)*

c. 5x5 averaging of Lt - Lr(765) and Lt - Lr(865)

- *assumes aerosol type and concentration vary on scales greater than 5km (20km for GAC)*
- *possibility of spreading sub-pixel clouds (high τ_a) into otherwise uncontaminated pixels*

d. use models from case c, but leave Lt as measured

- *smooth aerosol type, but leave concentration unchanged*
- *requires two passes through atmospheric correction*

e. 5x5 "epsilon" averaging

- *similar to case d, but can be done in 1 pass*

Epsilon Averaging

define NIR aerosol radiance at pixel i for wavelength λ as:

$$L_a(\lambda,i) = [\ (L_t - tL_f)/t_{O3} - L_r\ ]/t_{O2}$$

given a scan/pixel window centered on pixel x, containing a total of n unmasked pixels, compute mean $L_a(\lambda)$ at x as:

$$\langle L_a(\lambda,x)\rangle = 1/n\ \ \Sigma\ L_a(\lambda,i),\ \ i=1,n \text{ for } \lambda=765 \text{ and } 865nm$$

compute mean epsilon at x as:

$$\varepsilon_x = \langle L_a(765,x)\rangle\ /\ \langle L_a(865,x)\rangle$$

now compute a new $L_a(765,x)$ which would yield the mean epsilon when combined with the original $L_a(865,x)$:

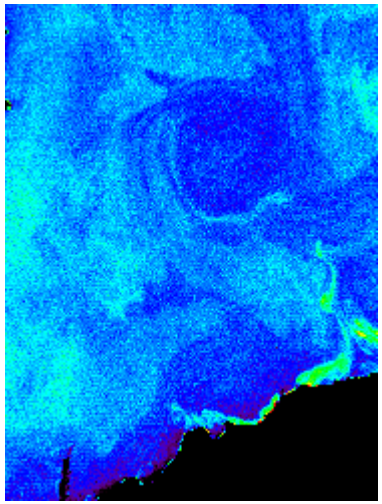
$$L_a'(765,x) = \varepsilon_x\ L_a(865,x)$$

and reconstruct the TOA radiance at 765nm:

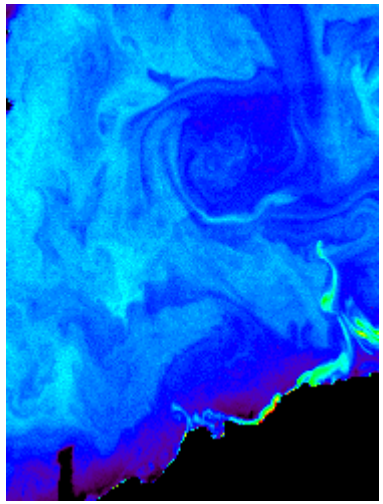
$$L_t(765,x) = [L_a'(765,x)\ t_{O2} + Lr]\ t_{O3} + tL_f$$

SeaWiFS nLw(443), Comparison of Smoothing Methods

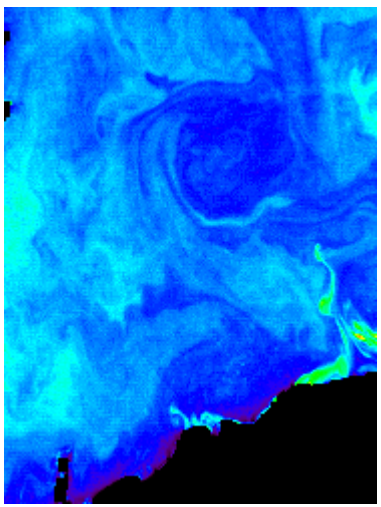
a. Standard Processing



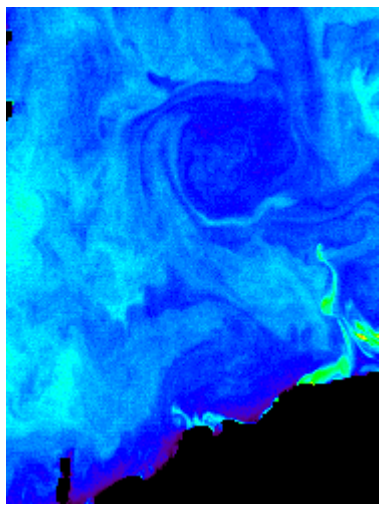
b. Fixed Model (c50, t99)



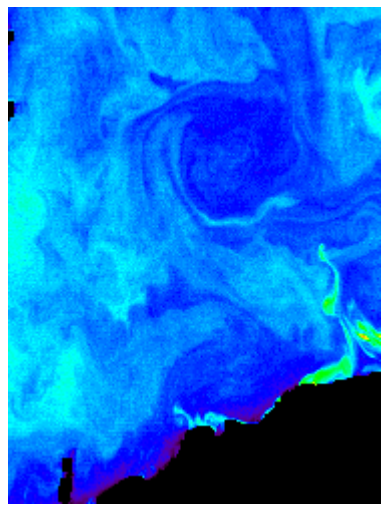
c. NIR 5x5 Averaging



d. Fixed Models from case c

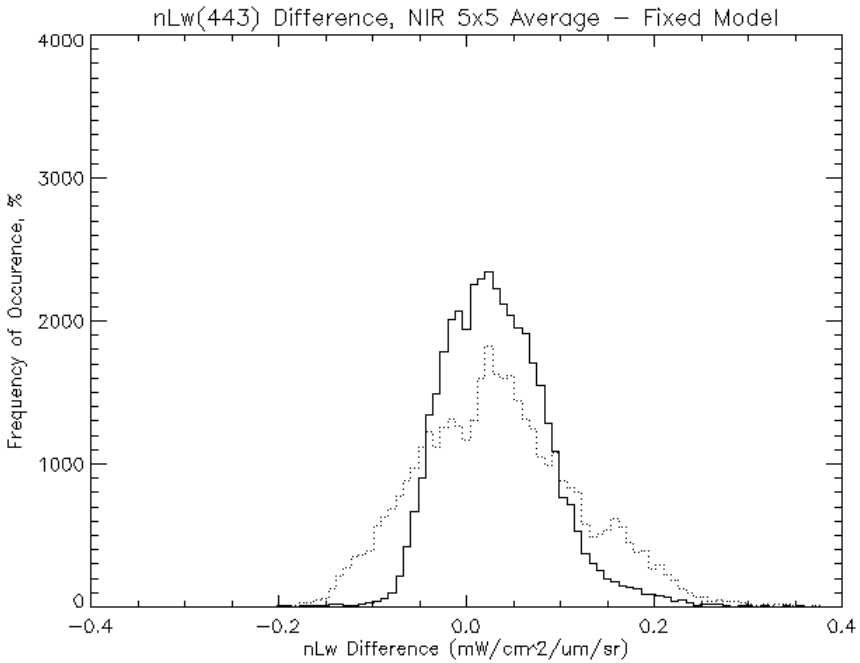


e. Epsilon 5x5 Averaging

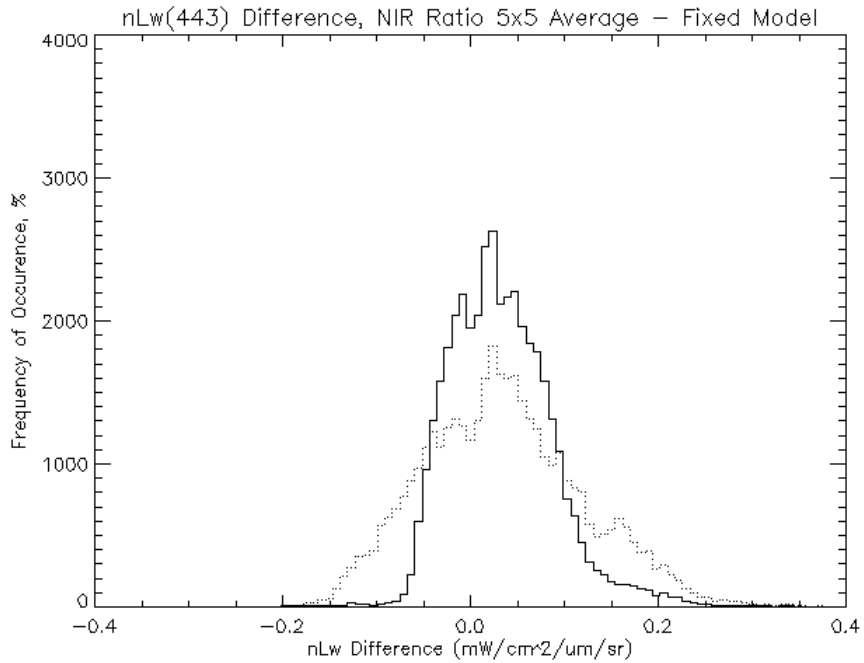


nLw(443) Difference Distribution
TOA Smoothing (c) versus Epsilon Smoothing (d)
Relative to Fixed Model Case (b)

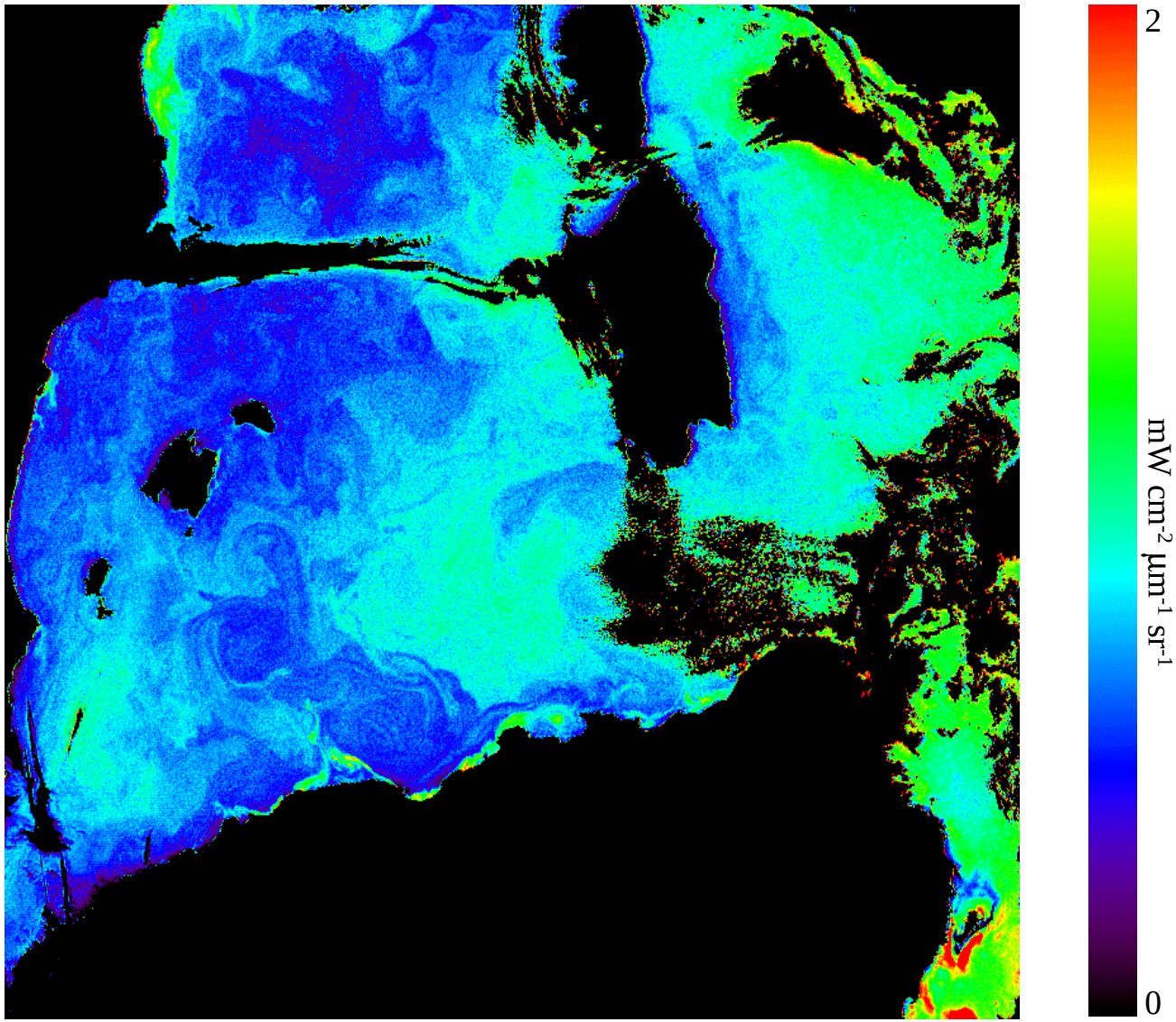
5x5 Averaging of Lt(765) and Lt(865)



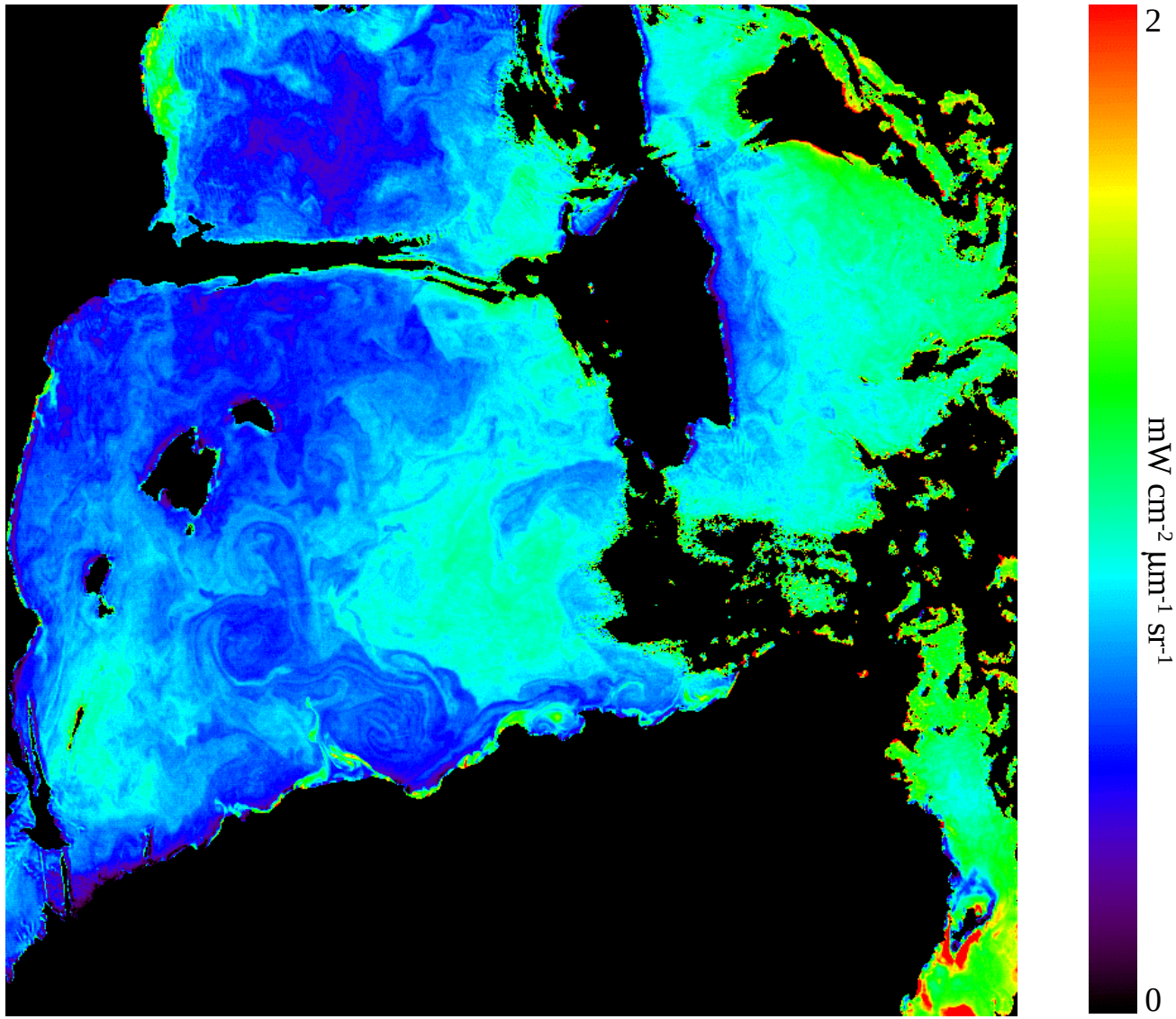
5x5 Averaging of Epsilon(765,865)



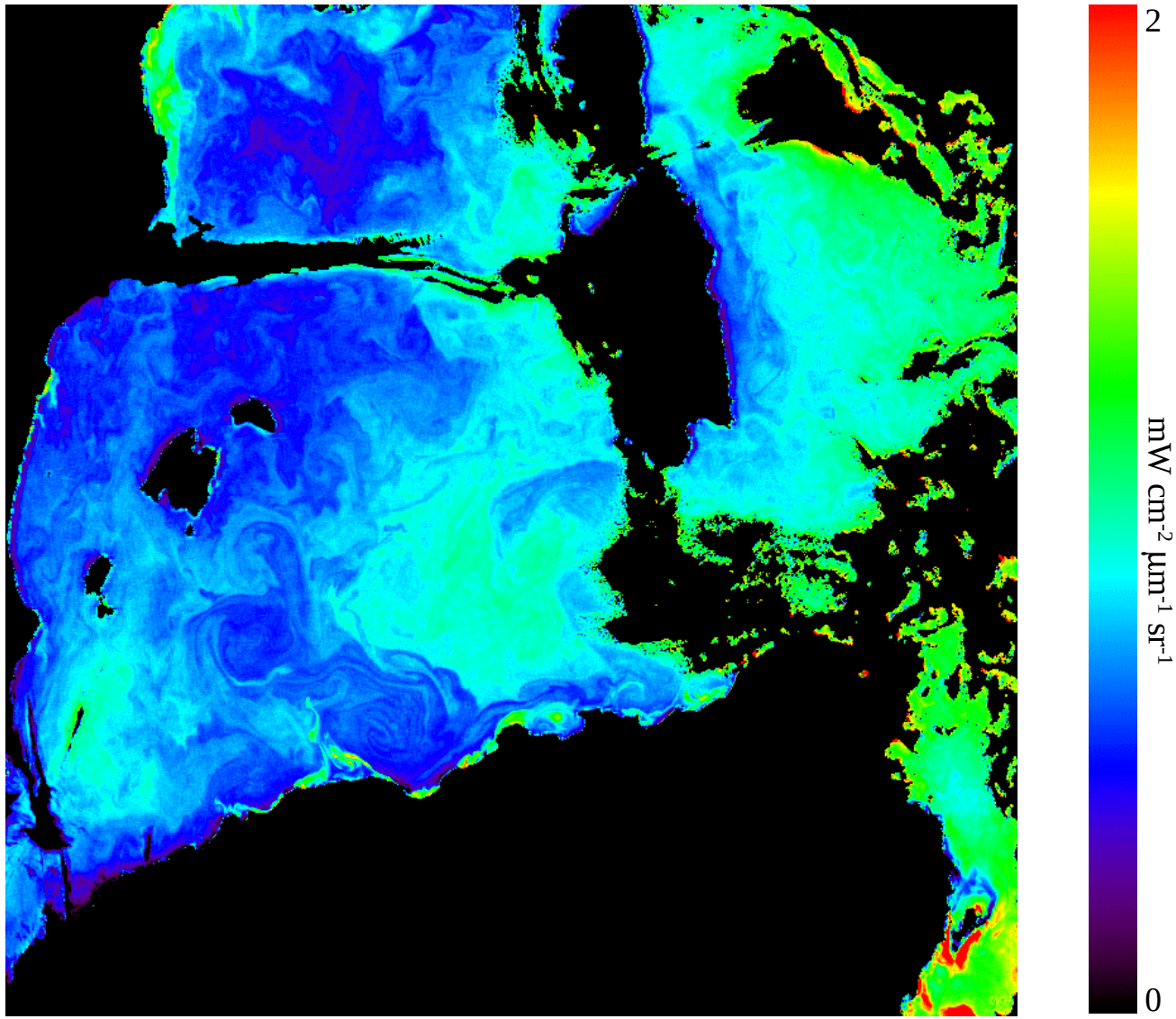
nLw(443), Standard Processing



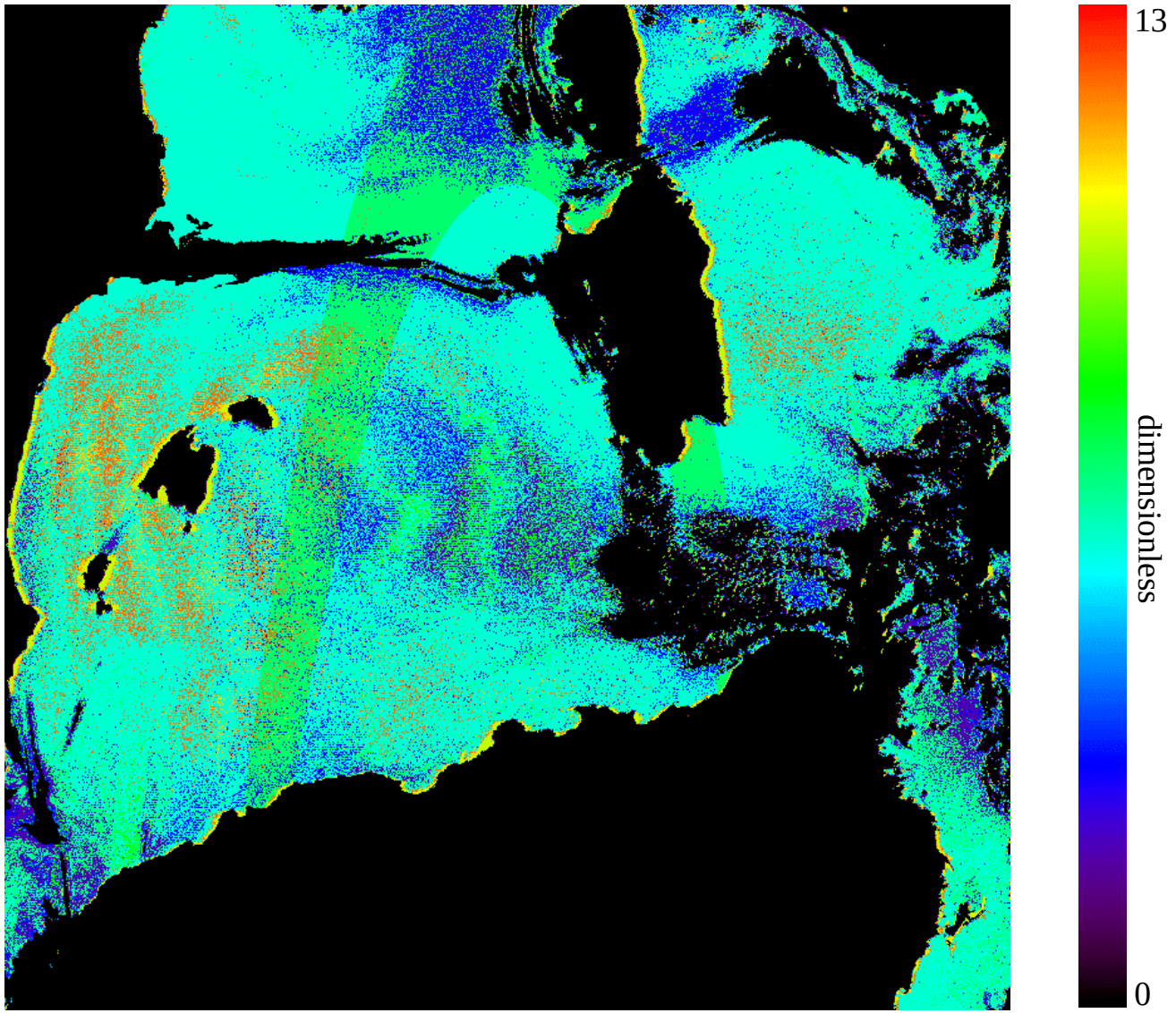
nLw(443), NIR 5x5 Averaging



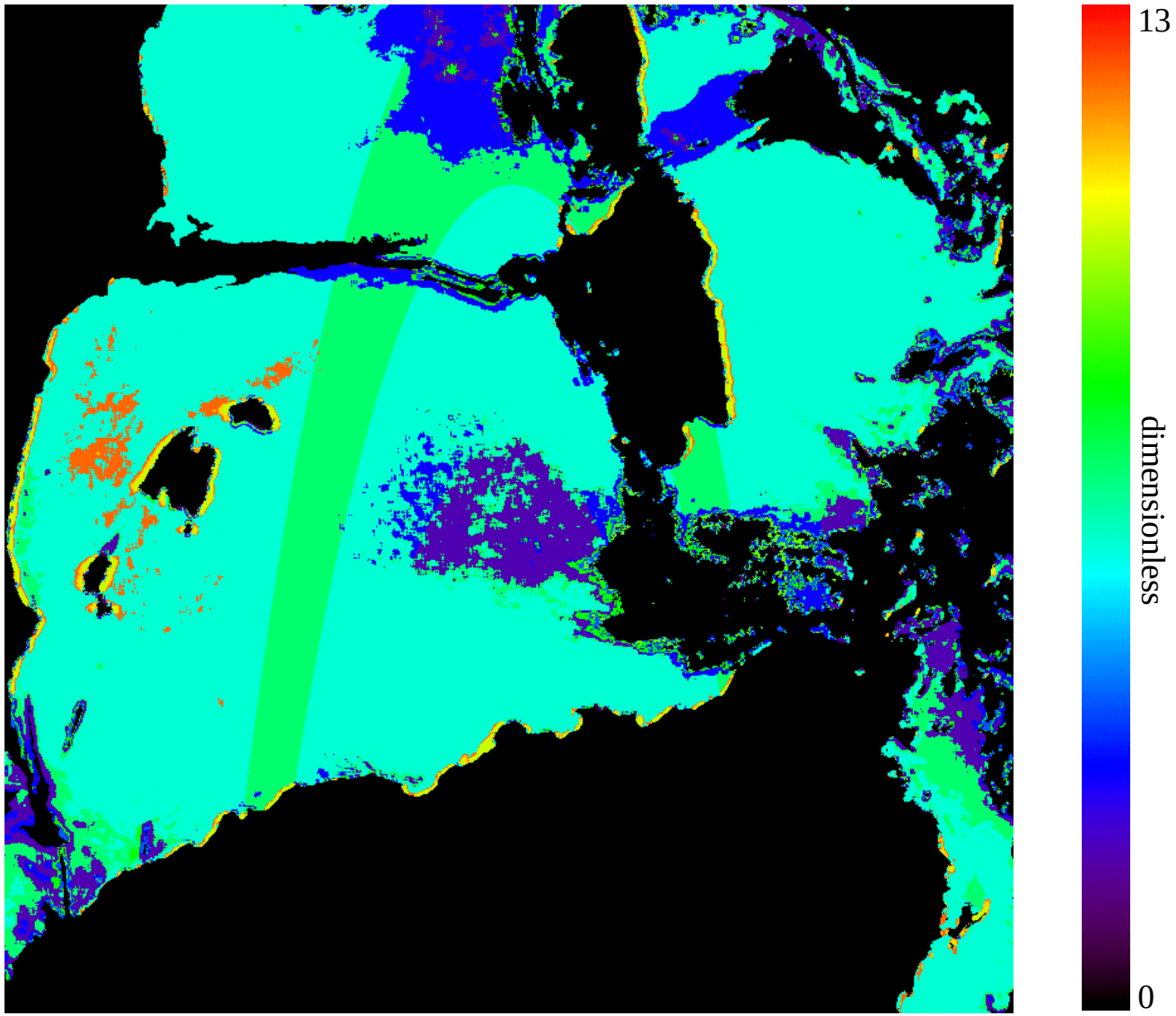
nLw(443), Epsilon 5x5 Averaging



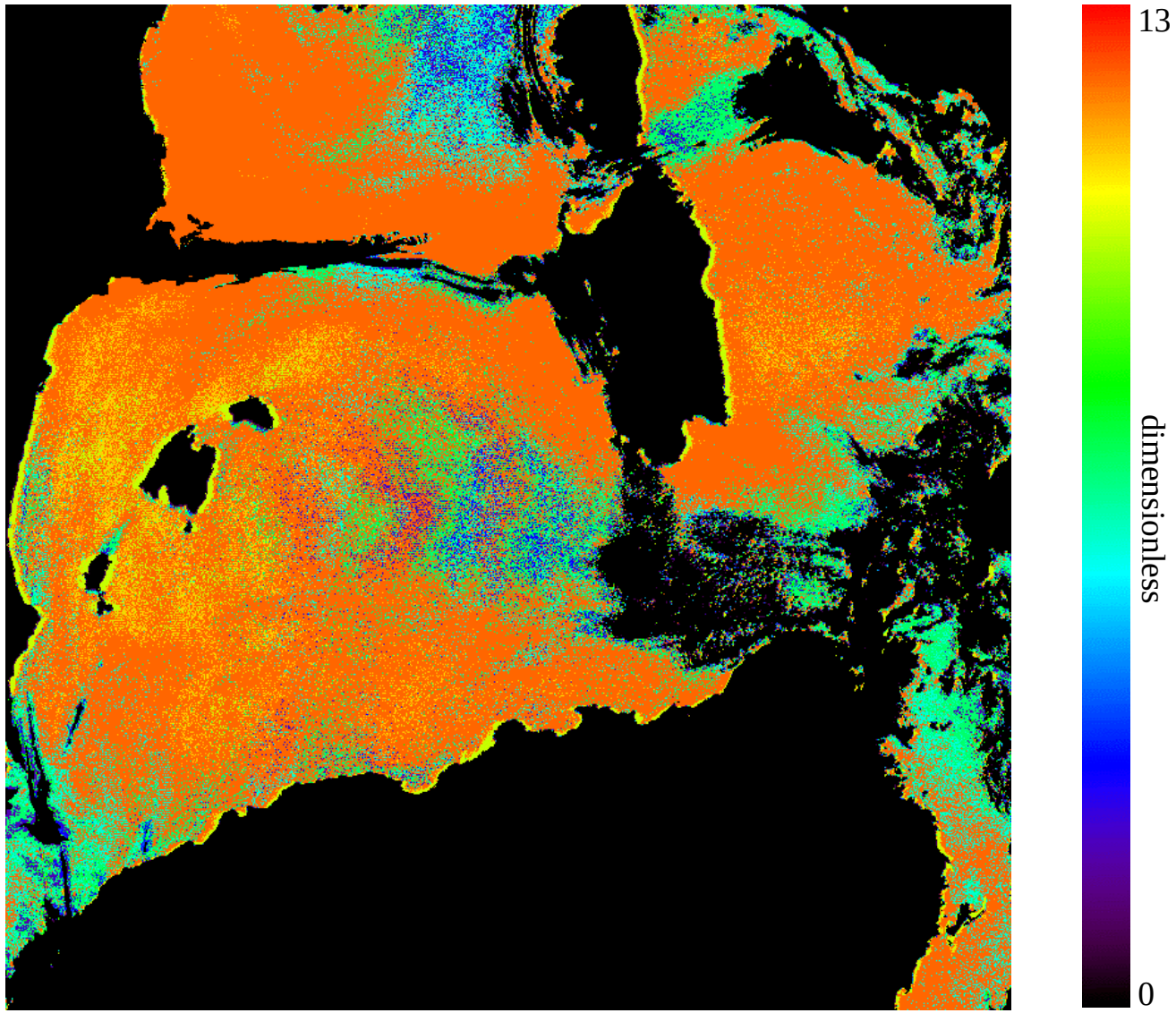
Lower Bounding Model, Standard Processing



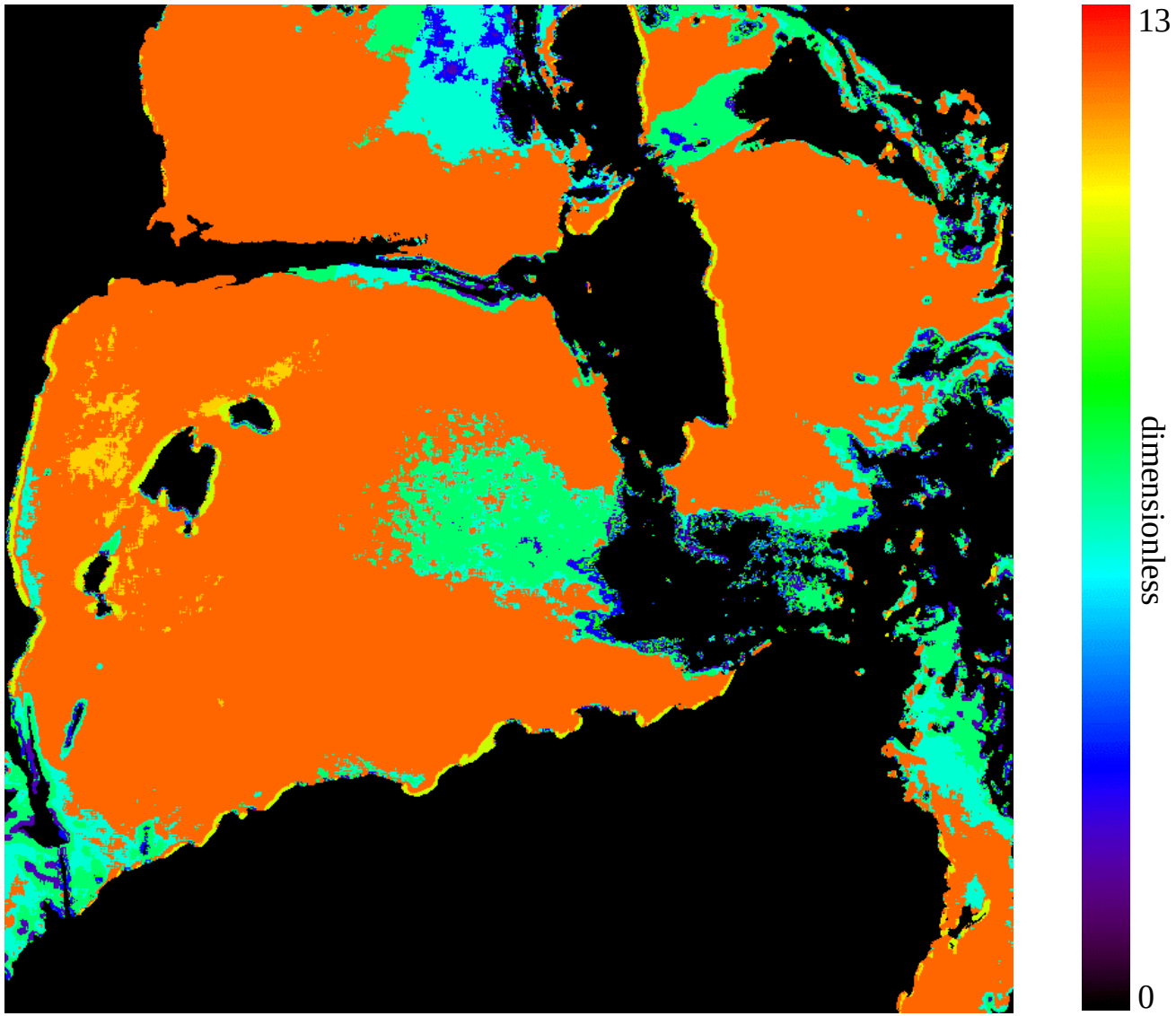
Lower Bounding Model, Epsilon 5x5 Averaging



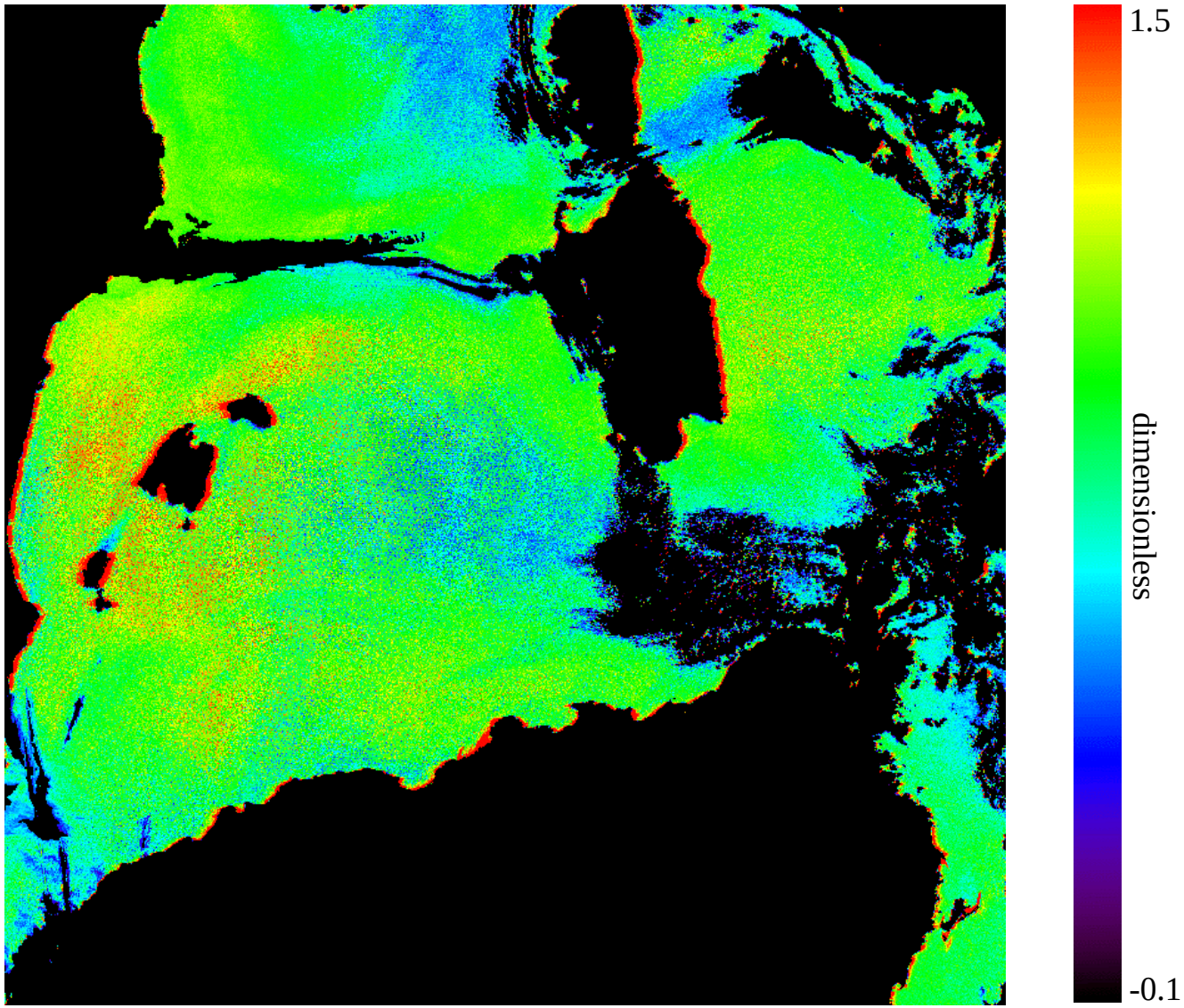
Upper Bounding Model, Standard Processing



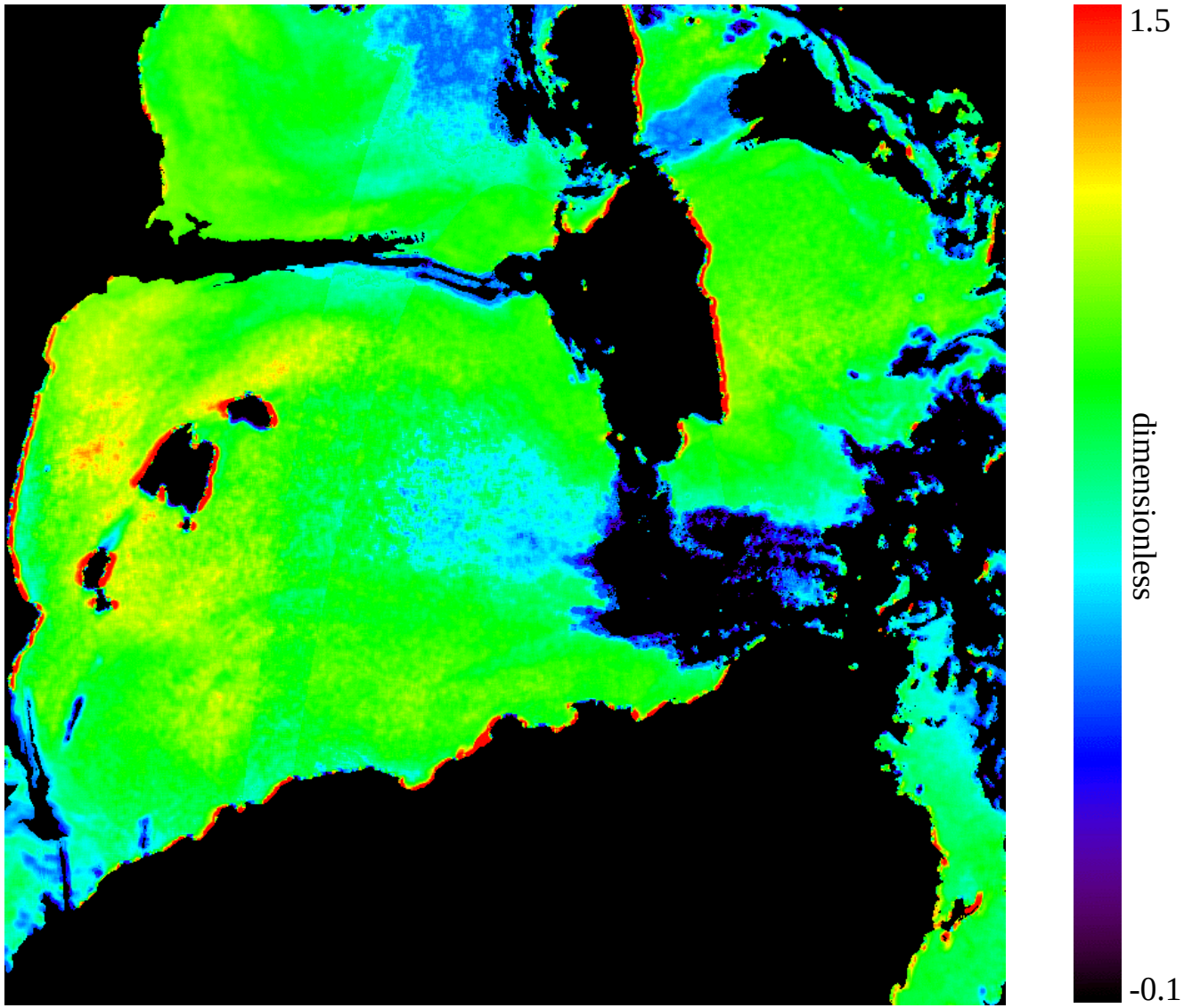
Upper Bounding Model, Epsilon 5x5 Averaging



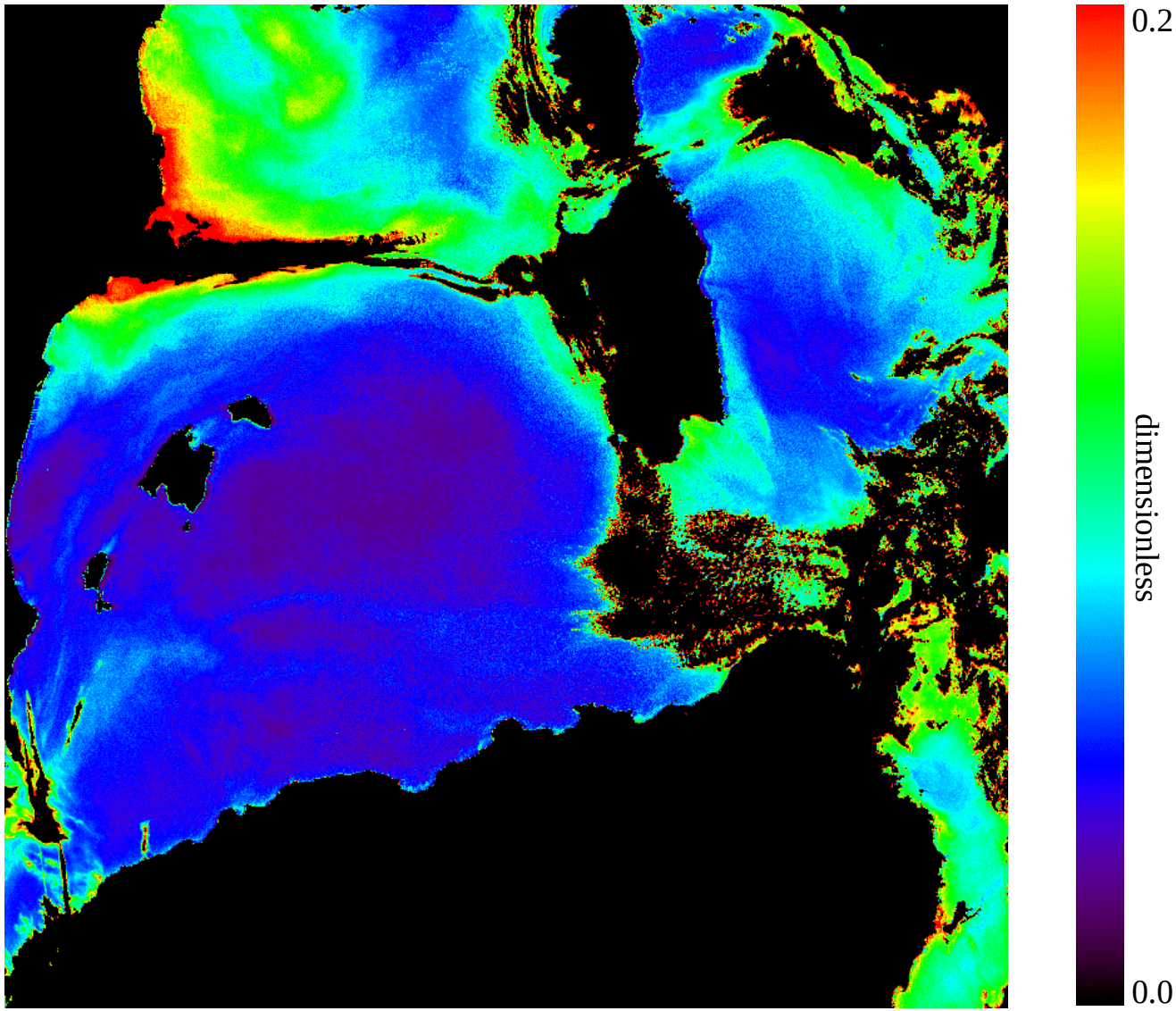
Angstrom(510,865), Standard Processing



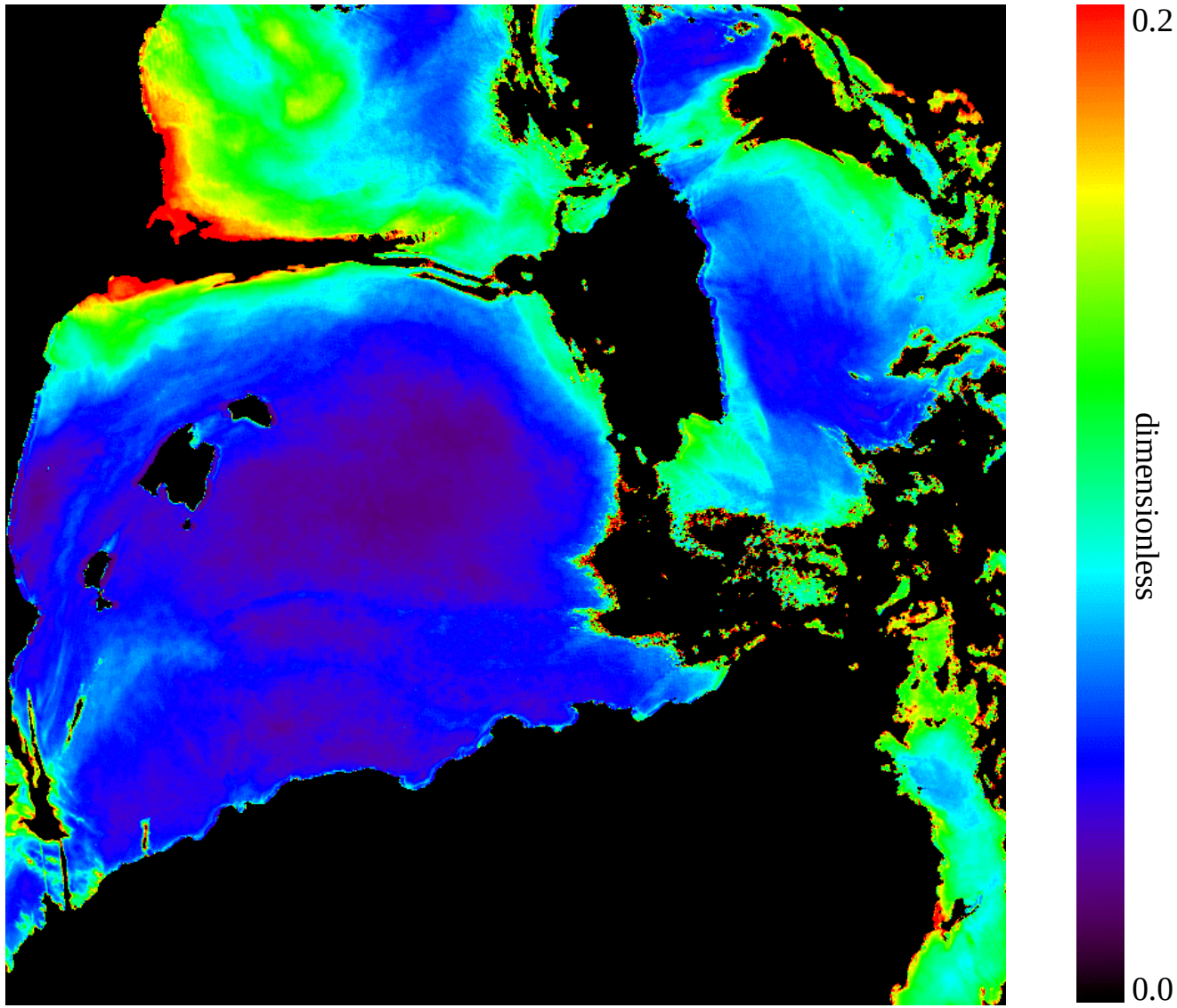
Angstrom(510,865), Epsilon 5x5 Averaging



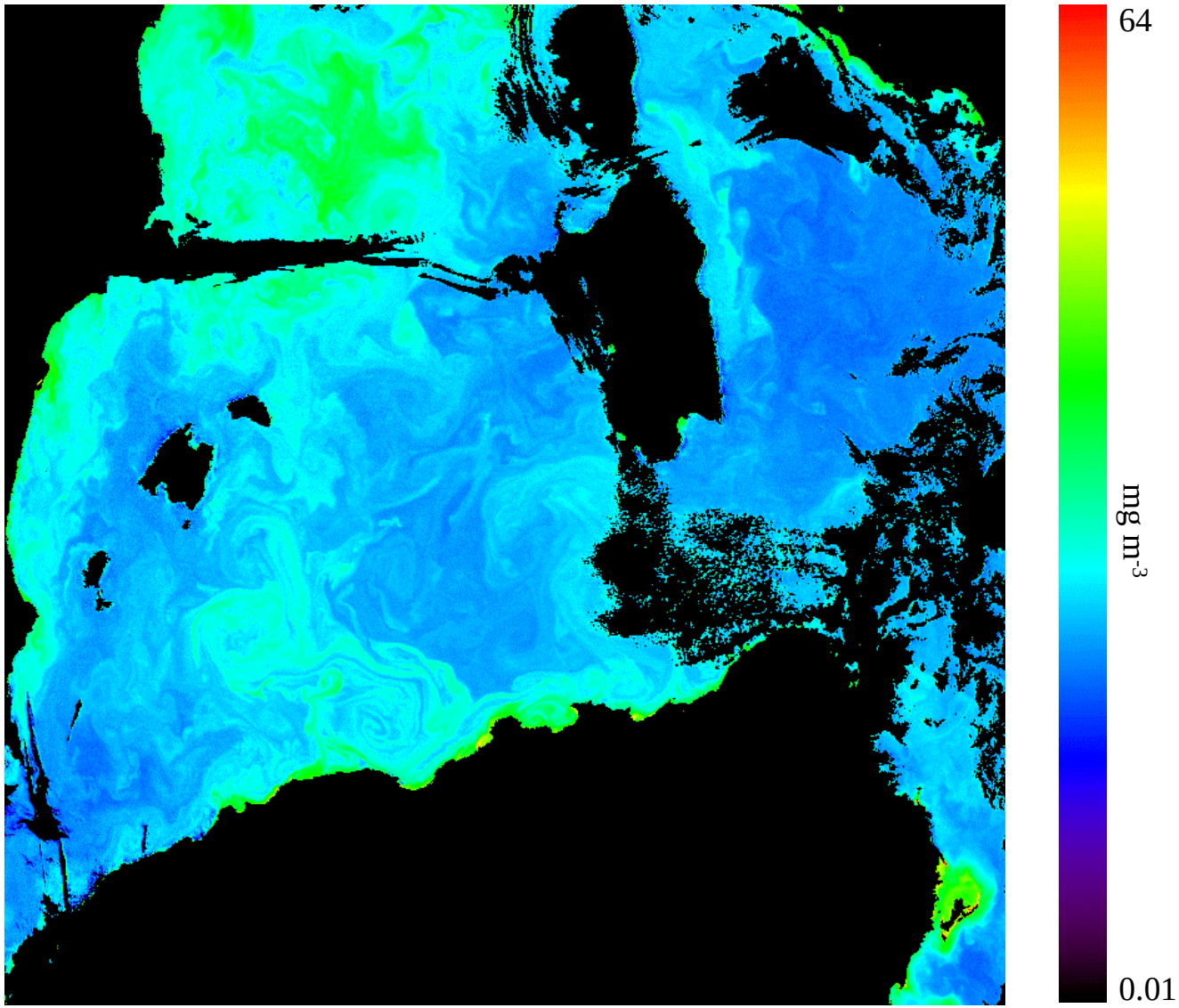
τ_a(865), Standard Processing



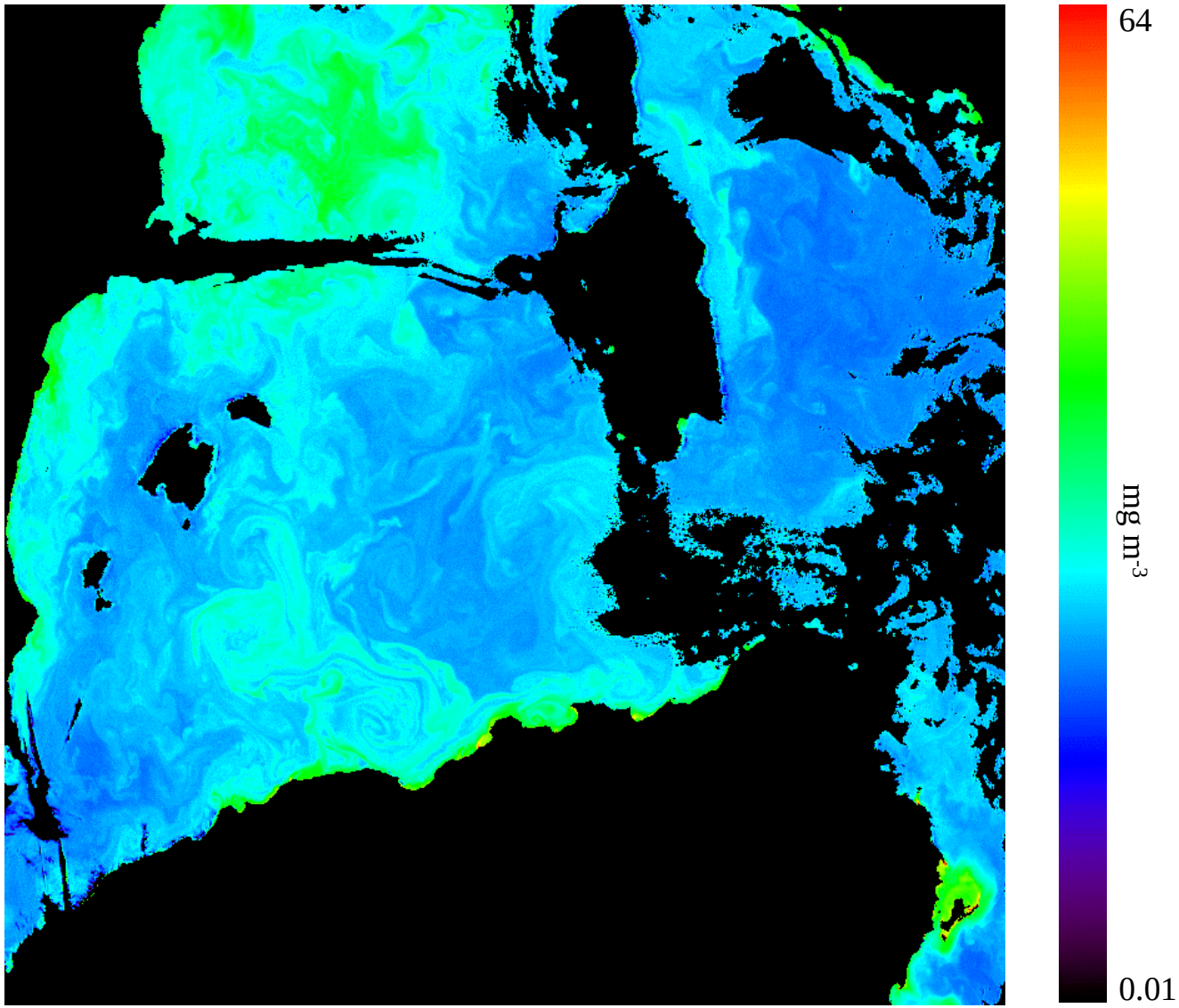
$\tau_a(865)$, Epsilon 5x5 Averaging



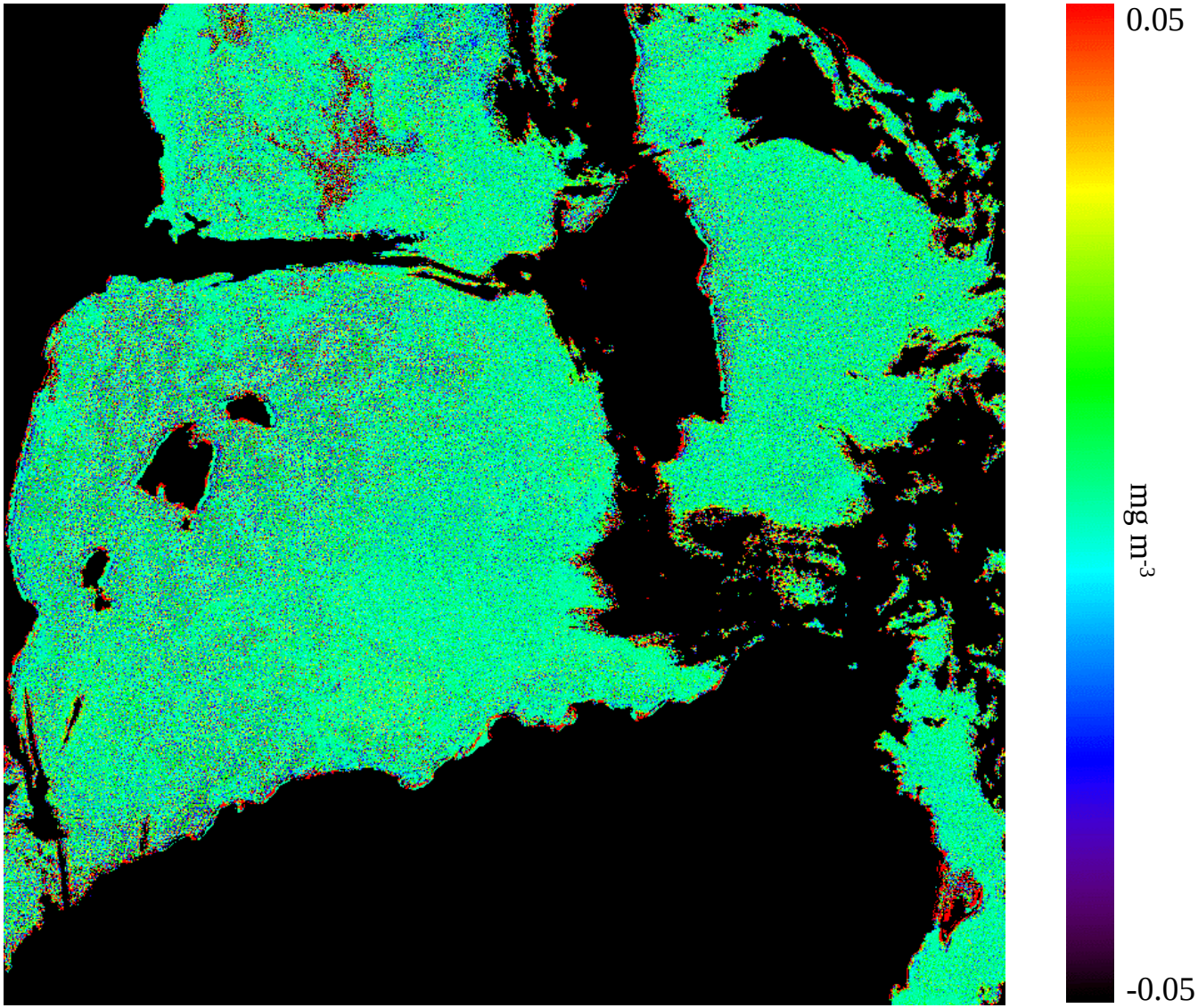
Chlorophyll, Standard Processing



Chlorophyll, Epsilon 5x5 Averaging

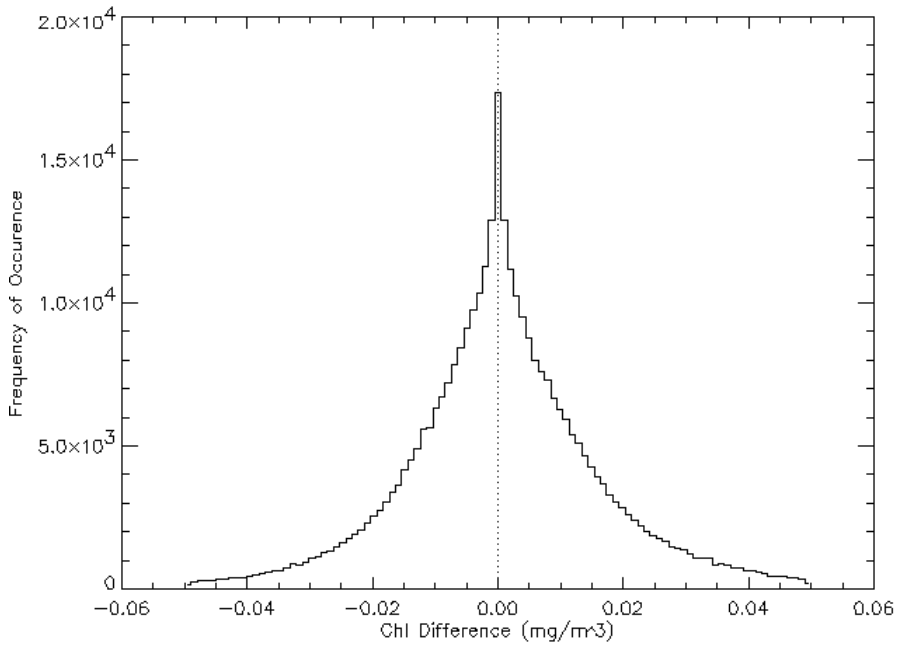


Chlorophyll Difference, Smoothed - Baseline

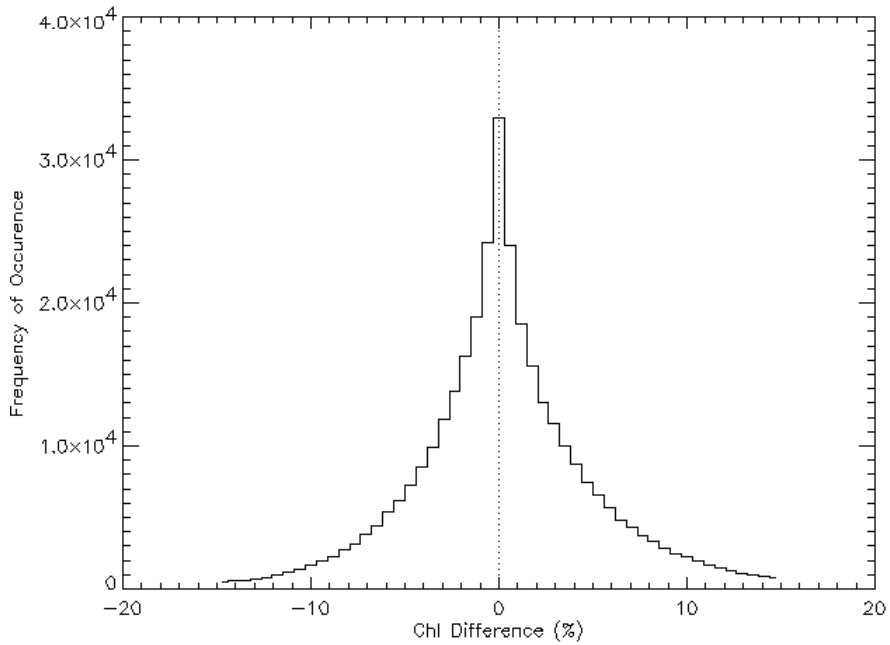


Chlorophyll Difference Distribution
Smoothed - Baseline

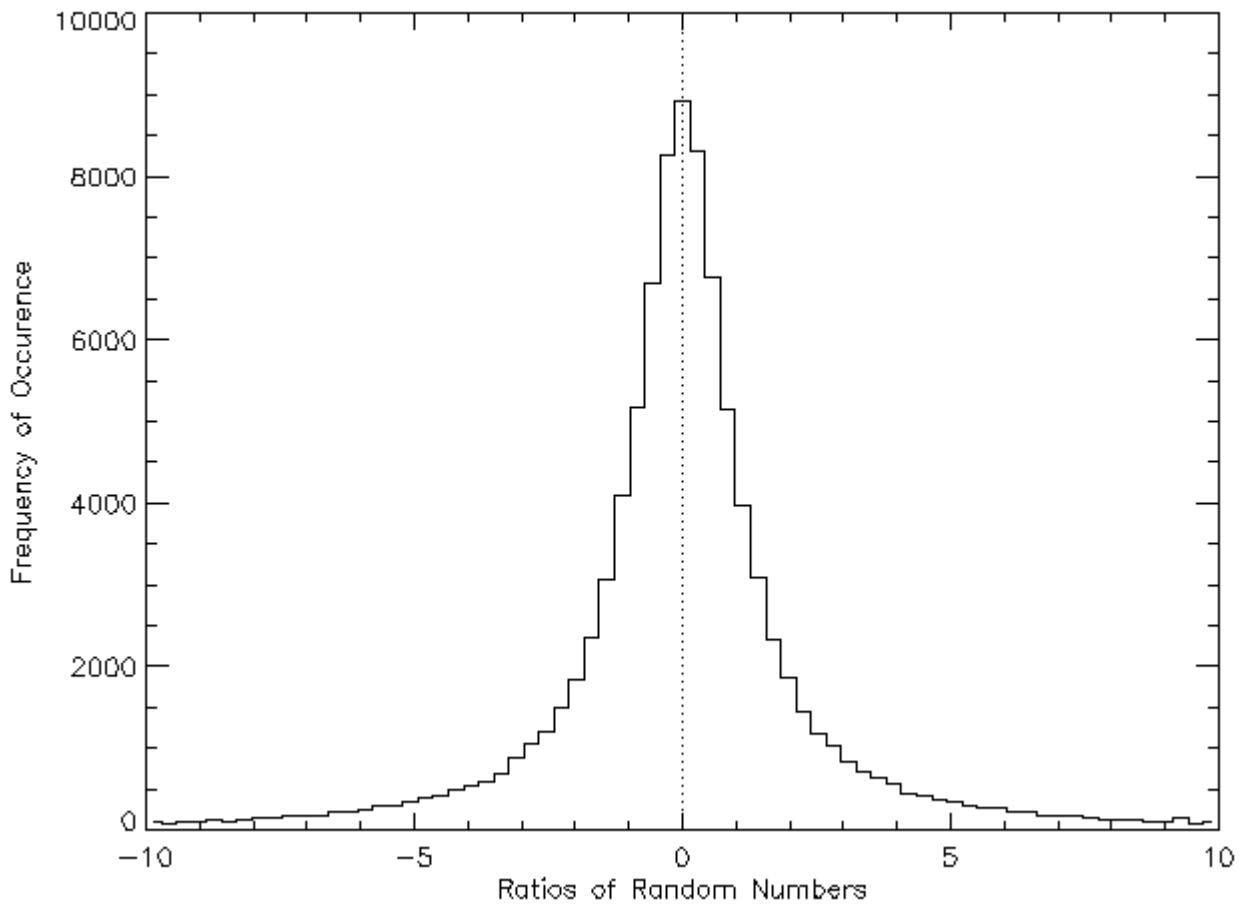
Difference, Chl (Smoothed) - Chl (Baseline)



% Difference, Chl (Smoothed) - Chl (Baseline)



Distribution of the Ratios of Random Numbers



nLw(443) Difference Distribution Smoothed - Baseline